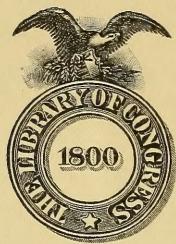


SH 351
.S5 C7
Copy 1



Class SH 351
Book - S5C7

THE NORTH CAROLINA GEOLOGICAL SURVEY

JOSEPH HYDE PRATT, STATE GEOLOGIST.

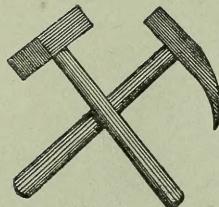
SH351
55C9

Economic Paper No. 12.

INVESTIGATIONS RELATIVE TO THE SHAD
FISHERIES OF NORTH CAROLINA

BY

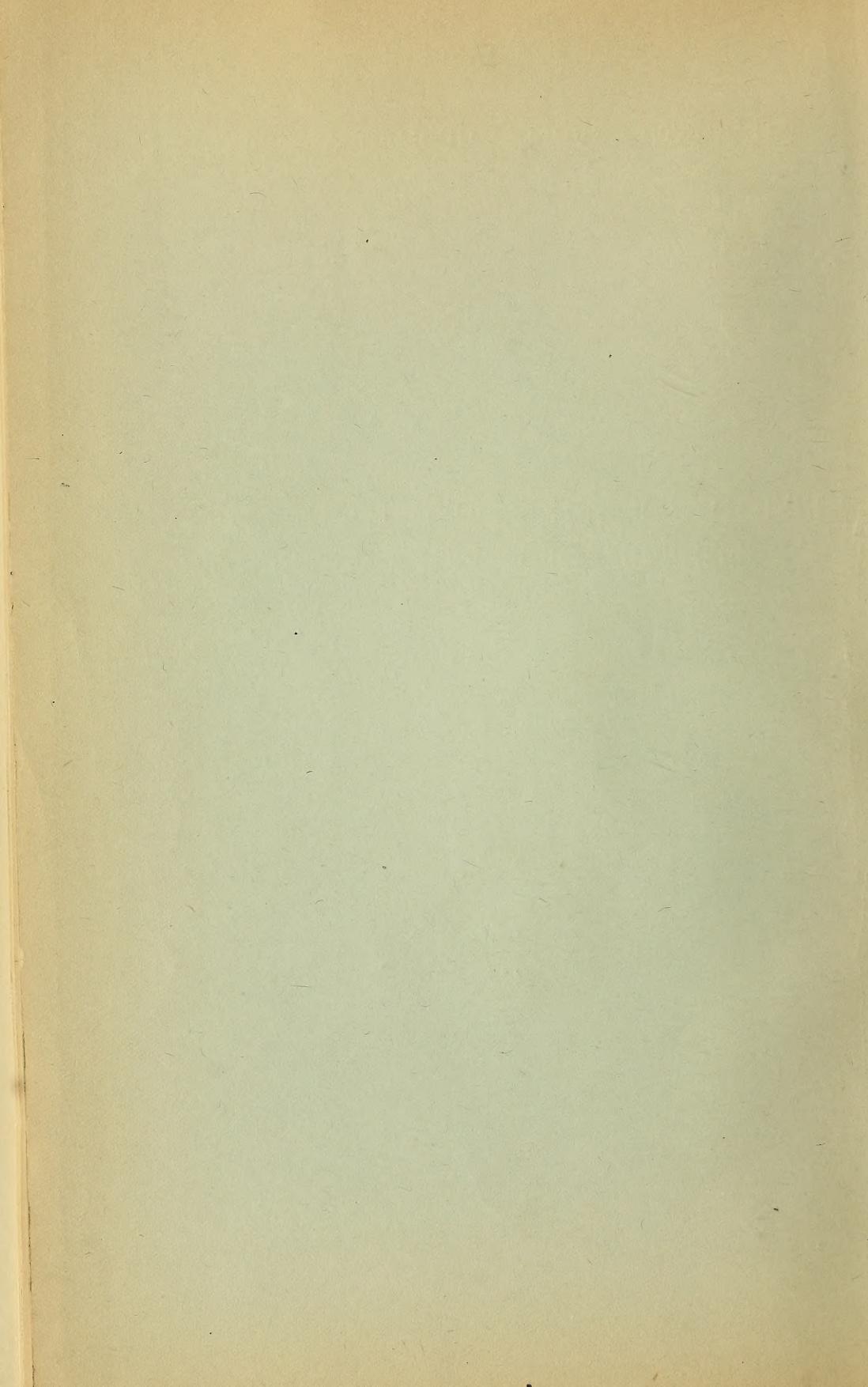
JOHN N. COBB.



RALEIGH:

E. M. UZZELL & Co., STATE PRINTERS AND BINDERS.

1906.



THE NORTH CAROLINA GEOLOGICAL SURVEY

JOSEPH HYDE PRATT, STATE GEOLOGIST.

Economic Paper No. 12.

145
434

INVESTIGATIONS RELATIVE TO THE SHAD
FISHERIES OF NORTH CAROLINA

BY

JOHN N. COBB.



RALEIGH:

E. M. UZZELL & Co., STATE PRINTERS AND BINDERS.

1906.

SH351
55C7

GEOLOGICAL BOARD.

GOVERNOR R. B. GLENN, <i>ex officio Chairman</i>	Raleigh.
HENRY E. FRIES.....	Winston-Salem.
FRANK R. HEWITT.....	Asheville.
HUGH MACRAE.....	Wilmington.
FRANK WOOD.....	Edenton.
<hr/>	
JOSEPH HYDE PRATT, State Geologist.....	Chapel Hill.

NOV 12 1907
D. or D.

4/28/08
3.3.1.4

LETTER OF TRANSMITTAL.

RALEIGH, N. C., August 1, 1906.

To His Excellency, Hon. ROBERT B. GLENN,

Governor of North Carolina.

SIR:—I herewith have the honor to submit for publication as Economic Paper No. 12 a report on the Investigations Relative to the Shad Fisheries of North Carolina. This report is supplemented by charts and tables which show the condition of this fishery in North Carolina for 1906, location of nets and the yield of fish. This paper has been especially prepared for the use of the committee who are investigating the general condition of all the fishing industries of North Carolina.

Yours obediently,

JOSEPH HYDE PRATT,

State Geologist.

CONTENTS.

	PAGE.
Preface	7
Introduction	9
Table I	10
Table II	Opposite
Tables III and IV	Opposite
Cape Fear River and Tributaries	11
The Wilmington Section	12
Drift-nets	12
From Black River to Fayetteville	14
Black River	14
North East River	16
Pamlico Sound	17
Dutch Nets in Pamlico and Albemarle Sounds	19
Neuse River and Tributaries	24
From the mouth to Contentnea River	24
From Contentnea River to Goldsboro	26
Contentnea River	26
Little River	27
Recommendations as to the Neuse River and Tributaries	27
Pamlico-Tar River	27
Tar River	29
Pungo River	29
Croatan Sound	30
Roanoke Sound	30
Albemarle Sound and Tributaries	31
North River	32
Pasquotank River	33
Little River	33
Perquimans River	33
Yeopim River and Creek	33
Chowan River	33
Roanoke River	34
Scuppernong and Alligator rivers	35
General Recommendations	37
Enforcement of the Law	37
Early closing of season	38
Cape Fear River	38
Northeast Cape Fear River	38
Black and other tributaries of the Cape Fear River	38
Neuse River	39
Pamlico and Pungo River	39
Tar River	39
Pamlico, Roanoke and Croatan Sounds	39
Albemarle Sound and Tributaries	39
Location of Fixed Shad Apparatus	39

MAPS.

Map of Cape Fear River, N. C.	40
Map showing approximate location of seines and pound-nets fished for shad in 1906	41
Map of Neuse River, N. C.	42
Map of Neuse River, N. C.	43
Map of Contentnea River, N. C.	44
Map of Tar River, N. C.	45
Map showing approximate location of seines and pound-nets fished for shad in 1906	46
Map showing approximate location of seines and pound-nets fished for shad in 1906	47
Map showing approximate location of seines and pound-nets fished for shad in 1904	48
Map showing approximate location of seines and pound-nets fished for shad in 1904	49
Map showing approximate location of seines and pound-nets fished for shad in 1904	50

PREFACE.

At the request of the North Carolina Geological Survey, the United States Bureau of Fisheries, through Hon. George M. Bowers, its Commissioner, detailed Mr. John N. Cobb as special agent to investigate the shad fisheries of North Carolina for the season of 1906. About seven weeks were spent in the field in examining the location of nets, taking account of the run and catch of shad, and making notes on the general fishing conditions in all the sounds and rivers flowing into them.

The condition of the fishing industry in 1906 is compared with previous years, and shows that this particular fishing industry is on a decline in North Carolina, and that unless some steps are taken to remove the causes, it would be but a few years before the shad-fishing industry would be at a very low ebb, if not a thing of the past.

This report is published as an Economic Paper of the North Carolina Geological Survey, with the permission of the United States Bureau of Fisheries, in order that it could be made of more use in connection with the deliberations of the committee recently appointed by the Geological Board to investigate the general condition of all fishing industries throughout eastern North Carolina.

JOSEPH HYDE PRATT,
State Geologist.

INVESTIGATIONS RELATIVE TO THE SHAD FISHERIES OF NORTH CAROLINA.

By JOHN N. COBB.

INTRODUCTION.

Pursuant to orders dated March 3, 1906, directing me to make certain investigations relative to the shad fisheries of North Carolina for the season of 1906, I left Washington on March 5, and, beginning my work on the Cape Fear River, I worked northward, visiting all the rivers and sounds where shad are caught.

Complete data covering the apparatus used in the fisheries were secured, but as the season was not yet at an end in any part of the State, only general information in regard to the catch of shad was secured covering the period up to the time of my visit.

For some seasons the shad fisheries of the State show a remarkable decrease, as is clearly evidenced by the table given herewith (Table I). In this table the catch of shad in each form of apparatus is shown for each year for which data are available. According to this table the fisheries gradually increased from 1880 to 1897, but from that time on the decline was much more rapid than the increase had been, as by 1904 the catch had dropped to practically what it was in 1880. In the seine fisheries 1896 was the banner year, when 2,131,864 pounds were secured. The decline was very rapid, however, as by 1904 the catch amounted to but 345,046 pounds. The most productive year for gill-nets was 1897, when 4,916,952 pounds were secured, but in 1904 the catch had dropped to 1,147,268 pounds. In 1887 the pound-net catch amounted to 389,921 pounds, but by 1897 it had increased to 2,328,585 pounds. In the face of a remarkable increase in the number of nets set since 1897 the catch decreased from season to season until in 1904, when the quantity secured in pound-nets was 1,647,897 pounds. The catch in minor apparatus reached its maximum in 1896 when 245,268 pounds were secured. By 1904 the yield in this apparatus had decreased to 89,548 pounds.

TABLE I.—Showing for certain years the catch of Shad in each form of apparatus used in the fisheries of North Carolina.

State.	1901.		1902.		1904.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Florida		\$-----	1,819,431	\$124,760	-----	\$-----
Georgia			1,029,050	75,189	-----	-----
South Carolina			434,133	20,732	-----	-----
North Carolina			6,566,724	384,808	3,229,759	312,950
Virginia	6,972,212	366,203	-----	-----	7,419,899	439,625
Maryland	3,111,181	120,602	-----	-----	2,912,249	159,772
Delaware	1,367,952	56,605	-----	-----	951,020	67,928
Pennsylvania	2,982,868	124,328	-----	-----	835,544	52,472
New Jersey	4,031,002	475,202	-----	-----	4,337,907	238,517
New York	3,432,472	110,682	-----	-----	498,119	36,826
Connecticut			479,780	26,003	-----	-----
Rhode Island			30,786	2,465	-----	-----
Massachusetts			21,247	1,137	-----	-----
Maine			848,999	28,959	-----	-----
New Hampshire			-----	-----	-----	-----
Total			-----	-----	-----	-----

TABLE II.—Showing by States the catch of Shad for certain years.

State.	1880.		1887.		1888.		1889.		1890.		1891.		1896.		1897.		1901.		1902.		1904.		
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
Florida	251,700	\$ 20,136			1,448,000	\$ 89,630	2,051,033	\$ 98,439	2,654,022	\$104,283			1,298,605	\$ 62,589	1,011,180	\$41,572					1,819,431	\$124,760	
Georgia	252,000	17,941	255,200	18,760	263,200	19,000	356,352	27,000	399,660	30,918			536,627	49,289	787,550	46,705					1,029,050	75,189	
South Carolina	207,600	12,432	365,772	22,840	432,800	27,050	577,457	42,696	563,259	41,187			671,513	33,436	506,125	27,696					434,133	20,782	
North Carolina	3,221,263	329,569	4,746,226	298,069	5,630,705	292,409	5,856,386	280,198	5,768,413	306,015			8,842,708	417,243	8,963,485	362,811					6,566,724	384,808	3,229,759
Virginia	3,171,953	134,496	*3,315,126	172,272	8,106,823	376,944			7,266,207	228,897	6,498,242	207,394	11,170,519	307,055					6,972,212	386,203		7,419,899	439,625
Maryland	3,759,426	140,326	*4,040,820	146,951	5,595,735	218,230			7,127,486	242,909	6,224,873	211,575	5,541,499	166,551					3,111,181	120,602		2,912,249	159,772
Delaware	1,050,000	52,500	1,270,492	47,629	1,389,216	51,999	1,498,653	64,903	1,797,218	66,812	1,500,196	64,699	1,933,294	69,260					1,367,952	56,605		951,020	67,928
Pennsylvania	559,600	27,980	1,423,952	76,175	1,387,200	76,942	2,752,572	125,717	2,898,551	131,226	2,692,864	128,274	2,501,143	79,445					2,982,865	124,328		835,544	52,472
New Jersey	750,000	35,000	6,494,957	308,147	6,523,447	307,411	10,423,572	372,543	10,622,719	409,659	10,225,455	443,438	13,909,826	340,056					14,031,002	475,202		4,337,907	238,517
New York	2,733,600	186,680	3,685,740	131,477	3,445,638	150,882	4,833,532	217,988	3,776,975	190,180	3,044,956	161,209	2,200,546	74,833					3,432,472	110,682		498,119	36,626
Connecticut	1,318,032	65,902	377,090	23,718	282,077	18,427	195,852	16,580					261,190	14,082					479,780	26,003			
Rhode Island	48,100	2,405	16,700	1,247	17,400	1,213	16,650	1,149					52,761	3,590					30,786	2,465			
Massachusetts	164,524	8,226	132,519	4,750	260,086	7,613	234,324	7,362					114,152	3,236					21,247	1,137			
Maine	580,319	11,876	1,095,720	27,330	839,256	24,368	887,800	18,687					1,404,477	30,778					848,999	28,959			
New Hampshire	6,417	321	30	4	80	3	88	3															
Total	18,074,534	995,790			35,621,668	1,662,121								60,498,860	1,651,443								

* Potomac and James Rivers not included.

† That portion of the Potomac River in Maryland is not included.

North Carolina in 18

Seines.

Number.	Length. Yards.	\$
2	100	
26	985	
12	560	
13	3,790	
7	460	
7	460	
16	9,135	
11	1,320	
3	7,450	
1	100	
4	4,400	
8	5,575	
110	34,335	

TABLE III.—Statement, by Water Areas, of the Apparatus Employed in the Shad Fisheries of North Carolina in 1896, 1904 and 1906

	Minor Apparatus.		Total.	
	Number.	Value.	Number.	Value.
Cape Fear Ri				
Below Blac	\$-----	48,487	\$ 14,749	
Above Blac	1,620	585	7,989	2,952
Black Rive	2,300	846	10,449	3,778
North East			6,442	2,353
Pamlico Soun			347,293	139,343
Neuse Rive				
Below Co	1,360	529	33,738	10,474
Above Co	3,324	1,280	4,526	1,728
Contentne	771	260	3,191	1,178
Little Riv				
Pamlico Riv	1,480	575	40,671	12,728
Tar River	3,620	1,270	5,442	2,004
Pungo Rive			3,864	1,251
Croatan Soun			77,758	34,261
Roanoke Soun			4,285	1,990
Albemarle So			178,886	64,650
North River			700	295
Pasquotank			1,230	442
Little River			890	389
Perquimans			12,250	4,010
Yeopim Riv			4,000	1,280
Chowan Riv			18,754	6,226
Roanoke Riv	6,890	4,336	14,810	6,869
Total	20,865	9,681	825,555	312,950

TABLE IV.—Statement, by Water Areas and Apparatus, of the Number and Value of Shad Taken in North Carolina in 1896 and 1904.

Waters.	1896.												1904.																							
	Drift Gill-Nets.			Stake and Anchor Gill-Nets.			Pound-Nets.			Seines.			Minor Apparatus.			Total.			Drift Gill-Nets.			Stake and Anchor Gill-Nets.			Pound-Nets.			Seines.			Minor Apparatus.			Total.		
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.						
Cape Fear River and tributaries:																																				
Below Black River	45,372	\$11,333	—	—	—	—	—	—	—	—	—	—	—	—	—	45,372	\$11,333	41,170	\$12,464	7,317	\$ 2,285	—	—	—	—	—	—	—	—	—	48,497	\$ 14,749				
Above Black River	5,375	1,584	—	—	—	—	—	—	668	200	6,719	1,658	12,762	3,442	6,229	2,314	—	—	—	—	140	53	1,620	565	7,989	2,952										
Black River	—	—	—	—	—	—	—	—	3,745	958	2,385	609	6,130	1,567	4,424	1,553	—	—	—	—	3,725	1,879	2,300	846	10,449	3,778										
North East River	4,062	1,033	—	—	—	—	—	—	6,989	1,589	—	—	11,051	2,622	2,192	763	—	—	—	—	4,250	1,590	—	—	—	—	6,442	2,353								
Pamlico Sound	—	357,236	96,249	60,853	13,478	—	—	—	—	—	—	—	448,089	109,727	—	—	—	—	121,616	47,745	225,677	91,598	—	—	—	—	—	—	347,293	139,343						
Neuse River and tributaries:																																				
Below Contentnea River	18,485	3,244	23,118	3,811	22,471	3,302	105,210	19,222	12,250	2,300	181,534	33,080	800	280	18,514	5,500	7,392	1,983	5,672	2,182	1,360	529	33,738	10,474												
Above Contentnea River	—	824	208	—	—	—	—	—	6,168	1,340	11,067	2,599	17,999	4,147	—	—	—	—	206	78	—	—	996	370	3,324	1,250	4,526	1,723								
Contentnea River	—	2,541	661	—	—	—	—	—	2,573	633	1,919	437	7,033	1,731	—	—	—	—	910	338	—	—	1,610	580	771	260	3,191	1,178								
Little River	—	—	—	—	—	—	—	—	186	44	309	65	486	105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—							
Pamlico River	5,221	1,139	8,114	1,632	7,759	1,538	32,178	6,161	1,010	200	54,282	10,679	3,700	1,133	6,576	1,914	19,075	5,797	9,810	3,309	1,480	575	40,671	12,723												
Tar River	—	—	—	—	—	—	—	—	6,515	1,278	6,285	1,359	12,860	2,637	—	—	—	—	—	—	—	—	1,822	734	3,620	1,270	5,442	2,004								
Pungo River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3,864	1,251	—	—	—	—	—	—	—	3,864	1,251						
Croatan Sound	—	68,626	14,006	73,834	13,925	20,000	3,800	—	—	—	162,460	81,781	—	—	—	—	—	—	4,898	2,165	72,660	32,096	—	—	—	—	—	—	77,758	34,261						
Roanoke Sound	—	5,000	1,084	2,081	386	—	—	—	—	—	—	—	7,081	1,470	—	—	—	—	1,560	749	2,725	1,241	—	—	—	—	—	—	4,285	1,990						
Albemarle Sound	—	429,599	82,664	173,380	32,094	132,213	25,401	—	—	—	735,192	140,159	—	—	61,954	23,293	69,848	24,665	47,084	16,692	—	—	—	—	—	—	—	176,886	64,650							
North River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	700	295	—	—	—	—	—	—	—	700	295							
Pasquotank River	—	1,000	190	2,840	460	4,642	893	275	56	8,757	1,599	—	—	—	—	130	57	1,100	385	—	—	—	—	—	—	—	1,230	442								
Little River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	350	148	450	203	90	38	—	—	—	—	—	—	—	—	590	389					
Perquimans River	—	12,424	2,380	12,718	2,417	7,680	1,502	—	—	—	32,822	6,293	—	—	—	—	1,750	650	10,500	3,360	—	—	—	—	—	—	—	12,250	4,010							
Yeopim River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4,000	1,280	—	—	—	—	—	—	—	4,000	1,280							
Chowan River	500	97	—	—	122,595	22,490	60,450	11,835	—	—	183,545	34,422	750	430	250	83	18,869	4,295	3,885	1,418	—	—	—	—	—	—	—	18,754	6,226							
Roanoke River	—	4,000	480	6,100	1,195	—	—	—	143,809	16,043	15,500	2,771	169,409	20,439	220	68	—	—	—	—	8,200	2,465	6,399	4,336	14,810	6,399										
Total	83,015	18,910	944,582	201,030	478,531	90,690	532,966	90,899	57,710	12,664	2,096,804	417,243	59,485	19,005	226,031	85,005	432,060	163,449	87,214	30,810	20,865	9,631	825,555	312,950												

Unfortunately, the decrease in the shad fisheries has not been confined to North Carolina alone, as is amply evidenced by the table on page 10, in which is shown for certain years the quantity and value of shad produced in each State on the Atlantic coast in which the shad fisheries are prosecuted. When data for certain States are not presented it indicates that the fisheries of that State were not canvassed by the Bureau for the year in question. According to Table II, all States, with the exception of Florida, Georgia, and Rhode Island (none of which have been canvassed since 1902, since which year the greatest decreases appear to have occurred), show large decreases since 1896, the fisheries of New Jersey alone having dropped from 13,909,826 pounds in 1896 to 4,337,907 pounds in 1904, a decrease of 7,571,919 pounds.

The two preceding tables (III and IV) show by water area the apparatus employed in the shad fisheries of North Carolina for the years 1896, 1904, and 1906; also the catch by each form of apparatus in 1896 and 1904. The most notable feature of the first table is the increasing use of pound-nets in the fisheries. In 1896 there were 1,575; in 1904, 2,837; and in 1906, 3,088. In 1896 there were 57,787 stake and anchored gill-nets employed in the shad fisheries. By 1904 the number had increased to 62,941, but by 1906 it had dropped to 40,089. Seines show a heavy decrease, having dropped from 230 in 1896 to 110 in 1904 and 109 in 1906. These tables have been discussed more in detail under the respective headings of the water areas.

In the following pages the condition of the shad-fishing industry along the various rivers and sounds is taken up under each river and sound, beginning with the Cape Fear River and its tributaries and extending northward.

CAPE FEAR RIVER AND TRIBUTARIES.

This is the most southern river which is wholly within the State. The main Cape Fear is navigable to Fayetteville, 145 miles from the ocean. This is also about the limit of the commercial fisheries for shad. In showing the data gathered during the season of 1906 the river has been divided into two sections—the Wilmington section, from the mouth of the river to the entrance of Black River, 15 miles above Wilmington, and the upper section, from the Black River to several miles above Fayetteville—for the purpose of comparison with the previous years.

THE WILMINGTON SECTION.

In this section drift and stake gill-nets are employed exclusively. The stake-nets are restricted to the east side of the river in New Hanover County, and as they must not approach the western shore nearer than a half mile, and are prohibited above the entrance of Brunswick River, they are practically confined to that section of the river between its mouth and the entrance of the Brunswick River. Although nets have in previous seasons been set as high as a little above the upper end of Campbell Island, in 1906 the uppermost net was located one mile above Doctors Point, while the lowermost net was set off the eastern end of Battery Island, near the mouth of the river. The greater part of the nets are between Federal Point and Doctors Point, where the river is the widest. According to law, the following rules prevail in setting these nets:

"They shall begin at a point 100 yards from the edge of the channel on the east side of said river and, running thence due east 120 yards, then leaving a gap of 120 yards. Then from the east end of said gap another net may be set 120 yards only, and to continue in the same proportion, always requiring a gap of 120 yards to intervene between each 120 yards of nets so set, and no net or sets of nets of any kind shall be placed opposite said gaps, within a distance of a half mile of same, and none of the nets so set shall be nearer than a half a mile of the west shore of said Cape Fear River."

The set-nets operated are about 12 yards long, with 5½-inch stretch mesh, and about 50 meshes deep. The largest number owned by any one man was 75. About two-thirds of the nets are in the water at one time, the others being on shore to be dried, cleaned, and repaired. Considerable complaint is made that the set-netters do not work their nets often enough, and as a result the fish are eaten by eels and crabs or washed out of the nets at the change of the tide. During 1906, 500 set-nets, with a total length of 6,070 yards, and a value of \$1,180, were set. This was an increase of 325 over 1904. None were operated in 1896.

Drift-Nets.—In this section of the river drift-nets are operated from a short distance above the Quarantine Station to Dollison, 1½ miles below the mouth of Black River. Below Wilmington, where the river is much wider than above, the nets range from 200 to 425 yards in length, have 5½-inch stretch mesh, and are from 40 to 60 meshes deep. Above Wilmington they are about 150 yards long, with 5½-

inch stretch mesh, and are 60 meshes deep. The drift-nets operated in the Brunswick River (this being a thoroughfare about 12 miles in length which leaves the Cape Fear River about 4 miles above Wilmington and re-enters it 4 or 5 miles below that city) average 130 yards in length, with $5\frac{1}{2}$ -inch stretch mesh, and are from 30 to 40 meshes deep. During 1906, 110 drift-nets, with a total length of 29,830 yards, and valued at \$4,895, were operated in this section, as compared with 90 nets operated in 1904 and 113 in 1896. In the latter year, however, much shorter nets were employed.

According to law, no drift-net longer than 300 yards can be operated in this section of the river; but this appears to be "more honored in the breach than in the observance" in the portion below Wilmington. The same is true of the law forbidding the catching of "any fish in the waters of the Cape Fear River from its mouth to the Bladen County line * * * between six o'clock P. M. on Tuesday and six o'clock P. M. on Wednesday." While I was in Wilmington (in March) the fishermen were much exercised over a rumor that the authorities of Brunswick County were going to enforce the law, but those on the New Hanover County side seemed to have no fear on that score.

One bad feature of the drift gill-netting below Wilmington is that the nets are run too close together and cover too much of the channel.

The total catch of shad in this section of the river, including also the North East River below Three Cypress, for certain seasons has been as follows: In 1889, about 70,000 fish; in 1890, 60,695; in 1891, 55,976; in 1896, 49,434; and in 1904, 48,487. In the latter year 41,170 shad were taken in drift-nets and 7,317 in set-nets. In 1890, 108 drift-nets were employed; 115 in 1891; 125 in 1896; 90 in 1904, and 115 in 1906. This gives an average per net of 562 shad in 1890; 487 in 1891, 363 in 1896, and 457 in 1904. As the catch of set-nets is available for one season only (1904), no comparisons can be made in regard to it.

Up to the time of my departure from this river (about the middle of March) but few shad had been secured. Most of the dealers and fishermen thought the season up to that time had been better than the season of 1905 during the same period, but all seemed to be agreed that the 1905 season was the worst they had ever experienced. Advices received as late as April 28 are to the effect that the season as a whole has been better than that of 1905.

FROM BLACK RIVER TO FAYETTEVILLE.

In this section of the river bow-nets and drift gill-nets predominate. In 1906, 85 drift-nets of a total length of 2,256 yards, and valued at \$442; 65 bow-nets, valued at \$140; and 5 seines with total length of 625 yards, and valued at \$670, were employed. The drift-nets were from 24 to 30 yards in length, with $5\frac{1}{2}$ -inch stretch mesh, and were about 22 meshes deep. The bow-nets in use were about 8 feet in diameter. The haul-seines averaged about 125 yards in length. The principal drift-net regions are from Kelley Cove to Elizabethtown, a distance of 35 miles, and from Finney's Bluff to Fayetteville, a distance of about 106 miles. In 1896 the lowest seine-beach on this river was at Prospect Hall, but in 1906 three were operated below this point—one each at Lloyds Landing, Grays Point, and Gastons Landing. At Prospect Hall two seines are operated in the busy season, one following closely after the other at the one shore. No seine-shores were operated above Prospect Hall in 1906, although in 1896 there were 3 in operation. The Powers fishery, located a short distance above Fayetteville, which was operated for a number of years, was abandoned several years ago upon the death of its owner, Mr. E. P. Powers. Above Fayetteville a few drift-nets, finger-traps, and bow-nets are operated occasionally, but mainly for home consumption, and no effort was made to secure data as to their number, etc.

In this section of the river in 1896 gill-nets took 5,375 shad; seines, 668, and bow-nets, 6,719—a total of 12,762. In 1904 gill-nets secured 6,229 shad; seines, 140; bow-nets, 1,620—a total of 7,989, thus showing a decrease, as compared with 1896, of 4,773 shad.

Up to and during my stay on this river very few fish were being taken by the fishermen in gill-nets, while the seines were unable to operate owing to the high water which had prevailed for some time.

It is against the law for any person to use more than one seine at any shore on the northeast branch of the Cape Fear River, and I would recommend that the same be made to apply to the Cape Fear itself.

BLACK RIVER.

This river, which flows into the Cape Fear about 15 miles above Wilmington, is quite narrow, ranging in width from 350 feet near

the lower end to 100 feet 50 miles above. About 53 miles from its mouth the South or South Black River enters it. But few shad go up the South River, however. About 84 miles from its mouth the Black River receives the Six Runs, up which there is a considerable shad run each season. Lisbon, 85 miles from the mouth, is the head of navigation during high water. As there are no falls on the Black River, shad can ascend to the uppermost limits.

Drift gill-nets, seines, and bow-nets comprise the apparatus employed in the shad fisheries. The drift gill-net reaches are from the mouth to Point Caswell, about 20 miles, and from Herring Landing to Carty Cove Landing, about 6 miles. In the former reach the nets are from 100 to 150 yards in length and in the latter are about 15 yards in length, all having a stretch mesh of $5\frac{1}{2}$ inches. The seines range from 25 to 40 yards in length. Most of these are hired out by the day to persons who may wish to secure a supply of shad for home use, the usual compensation being \$2 for either a night or a day. The bow-nets are operated mainly on the Six Runs. Owing to the lack of convenient markets the fishing on this river is very desultory. In 1896 there were operated 21 seines and 60 bow-nets; in 1904, 26 drift gill-nets, 26 seines, and 61 bow-nets, and in 1906, 28 drift gill-nets, 22 seines, and 31 bow-nets. In 1896 the catch with seines amounted to 3,745 shad, and with bow-nets 2,385, a total of 6,130. In 1904 the drift gill-net catch amounted to 4,424 shad; the seine catch to 3,725 shad, and the bow-net catch to 2,300—a total of 10,449, a gain of 4,319 over 1896. This gain is due almost entirely to the employment of drift gill-nets in 1904, none being used in 1896.

At present it is unlawful to operate fishing-gear in the Black River, within the limits of Pender County, "between six o'clock P. M. on Tuesday and six o'clock P. M. on Wednesday." It is also forbidden to fish "in that part of Black River in Sampson and Cumberland counties and below the Atlantic Coast Line Railway bridge, * * * otherwise than with hook and line." * * * It is also forbidden to operate nets in the Black River and its tributaries "between the 15th days of May and August of each year." These laws seem to be all that are needed on this river.

NORTH EAST RIVER.

This river, which is about 120 miles in length, rises in the northeast portion of Duplin County and empties into the Cape Fear at Wilmington. It is navigable for small steamers as high up as Hallsville, a distance of 89 miles. A few fishermen from Wilmington and points along the shore operate drift-nets from the mouth to Castle Hayne, a distance of 27 miles; these nets being about 150 yards in length, 5½-inch stretch mesh, and about 60 meshes deep. A few drift-nets are also operated in the vicinity of Rocky Point, about 35 miles from the mouth. The greater part of the fishing, however, is carried on with seines. These are operated from Krooms Bridge, 56 miles from the mouth, to Kornegays Bridge, a distance of 103 miles from the mouth. In 1896 there were operated on this river 12 drift gill-nets and 17 seines; in 1904, 13 drift gill-nets and 12 seines; and in 1906, 13 drift gill-nets and 17 seines. A number of seine-beaches have not been worked for some years now, owing to the scarcity of fish. In 1896 the number of shad taken in gill-nets was 4,062, and in seines, 6,989—a total of 11,051. In 1904 the catch of shad in gill-nets was 2,192, and in seines 4,250—a total of 6,442, or a decrease of 4,609. Up to the time of my visit to this river in March almost no fish had been taken, and what little had been secured were taken by gill-nets, as the river had been quite high for some time and the seines were unable to operate.

The following are the laws at present in force on this river:

“If any person shall fish in the northeast branch of the Cape Fear River with seine, net, or trap, from the twenty-third day of February to the first day of July of any year, between the hours of six o’clock P. M. on Saturday and six o’clock P. M. on Monday of each week, or shall at any time use more than one seine at a time in any fishing-hole in said river, or use, set, or place in said river any hedge, trap, or other obstruction which will prevent the free passage of fish up said river, which said hedge, trap, or other obstruction shall extend more than one-third across the main channel of the said river, he shall be guilty of a misdemeanor. This section shall not apply to that portion of said river which lies between the city of Wilmington and a point on said river known as The Three Cypress, 12 miles distant from said city of Wilmington.”

In that portion of the North East River in Pender County, fishing with nets is prohibited "between six o'clock P. M. on Tuesday and six o'clock P. M. on Wednesday."

The destruction of fish by any means, except with hook and line, is prohibited in that portion of the North East River lying in New Hanover County "between the fifteenth days of May and August of each year."

There does not seem to be any necessity for additional laws covering the fisheries of this river.

PAMLICO SOUND.

Pamlico Sound is an irregularly shaped body of water running parallel to the coast line for about one-fourth of the length of the State, being separated from the ocean by a long, narrow sand-beach known as "The Banks." This sound is about 75 miles long, measured on a line drawn from the mouth of the Neuse River northeastward, the greatest width about 25 miles and the average width nearly 20 miles, the whole covering about 1,660 square miles. At the north end it communicates with Albemarle Sound through Roanoke and Croatan sounds, while on the south it joins Core Sound. Two large rivers, the Neuse and Pamlico, enter the sound from the west. Communication is had with the sea through Oregon, New, Hatteras, and Ocracoke inlets, each less than half a mile across. The greatest depth of water in the sound is 24 feet, but shoals, especially in the northeastern portion, are numerous. As the river water from about one-half of the State, and a part of Virginia, empties into Pamlico Sound, it counteracts the effect of the natural ebb and flow of the ocean tide, and as a result there are no tides in the sound except such as are produced by heavy winds. During the greater part of the year the waters of the sound are salt or brackish, but during the season of heavy rains the immense volume of water coming down from the rivers makes the water, except in the vicinity of the inlets, quite fresh.

Owing to its extremely favorable location, the shad fisheries of this sound are the most important in the State. By far the greater part of the fisheries are located in the northeastern portion, where the shoals are most numerous, east of a line drawn from Hatteras Inlet to Long Shoal Point, almost all of this area being within the

bounds of Dare County. The fishing is generally carried on from temporary camps scattered along and over the sound, the most important of these being Roanoke Marshes, Hog Island, Duck Island, Sandy Point, Rodmans, Baums Slew, Davis House, and Gull Island in Dare County, and Swan Point in Carteret County. The permanent settlements from which fishing is prosecuted are Stumpy Point, Englehard, Manteo, Rhodanthe, Avon, Buxton, Trent, and Hatteras, in Dare County, and Hobucken in Pamlico County.

Stake-nets and pound-nets were almost the sole apparatus used in the capture of shad in the sound in 1906, but 14 anchored gill-nets having been employed. Stake-nets average 18 yards in length, 6 to 16 feet deep, with $5\frac{1}{4}$ to $5\frac{1}{2}$ -inch stretch mesh, and are set in strings comprising a widely varying number. The greater part are set on the shoals in the eastern part of the sound, north of New Inlet, the Duck Island flats being the favorite spot from about 1894 to 1905, when the Vann law compelled the greater part of the nets set here to be removed. On these flats the depth averages 3 feet and in many places is so shoal that the fishermen can wade alongside the nets very easily, and thus remove the fish. The nets set in the sound are generally allowed to remain in the whole season, as they do not seem to rot or foul as in the fresh water. The season for gill-nets is generally from the first week in February to about the middle of April. The gill-netters of this region have had a number of disastrous seasons of late years, owing largely to the unusual clearness of the water; but up to the middle of March of the 1906 season gill-nets had secured nearly all of the few shad taken up to that time. As remarkably good prices were obtained for these, it is probable that the gill-netters ended the season with a balance on the profit side. During the season of 1906, 19,483 stake and anchored (14 of the latter style) gill-nets, with an aggregate length of 255,442 yards, and a total value of \$29,409, were used. In 1904, 40,000, and in 1896, 24,808 of these nets were operated. The drop of 20,517 in two years is partly explained by the operation of a new fishery law, which will be discussed farther on. These nets, in 1896, took 387,236 shad, while in 1904 but 121,616 shad were secured, a decrease of 265,620 fish, at the same time that there was an increase of 15,192 in the number of nets used. This gives an average of almost 16 shad to the net in 1896, and only 3 shad to the net in 1904—a most remarkable falling off.

During the season of 1906 fishing for shad with gill-nets was prosecuted for the first time off Swan Point, in Carteret County, by fishermen from Roe in the same county. Stake gill-nets to the number of 709 and 14 anchored gill-nets were used. The stake-nets were of the regulation kind operated in the sound, while the anchored nets were each about 100 yards in length, 5½-inch stretch mesh, 40 meshes deep, and cost about \$15 each. A fairly profitable season was had.

The pound-nets in this region cost about \$100 each. The "pound" is generally 10 yards square, the "heart" 45 yards on each side, and the "leader" from 50 to 350 yards long. The mesh in the "pound" is 2½ inches, in the "heart" 3 inches, and in the "leader" 4 inches. A number of fishermen, however, operate what are known as "shad-pounds," the only difference being in the wider mesh of the different parts, in order that herring and other small fish may pass through. They are generally set from the shore in strings of from 1 to 10, but during the last few seasons a number have been set along the outer line of shoals in the northeastern part of the sound. The pound-nets in this sound have been steadily increasing in number for some years. In 1896, 171 were in use; in 1904, 474, while in 1906 the number had increased to 678—a gain of 507 in ten years. The catch of shad in pound-nets in 1896 was 60,853 in number, while in 1904 it amounted to 225,677 fish—a gain of 164,824. In 1896 the average catch of shad per net was 355, while in 1904 it was 476, thus showing a real gain. The season of 1906 was an exceptionally poor one for the pound-netters, owing to the muddy water, the fishermen claiming that shad will not enter the nets in any number unless they are able to see the leader distinctly.

The Legislature in 1905 passed the following law, commonly known as the Vann law, the greater part of which applies exclusively to Pamlico Sound:

Dutch-Nets in Pamlico and Albemarle Sounds.—If any person shall set or fish any net, seine, or appliance of any kind for catching fish at any place within a radius of two and one-half miles either way from Roanoke Marshes light-house at a distance more than five hundred yards from the shore of Roanoke Island or the mainland on the western side of Croatan and Pamlico sounds; or shall set or fish any pound or dutch-net on the eastern side of Pamlico Sound within ten miles of the Roanoke Marshes light-house, except such as shall be fished within five hundred yards of the Roanoke Island or Hog Island shores; or shall set or fish any dutch or pound-net on the eastern side of Pamlico Sound more than two thousand yards west of a

line running south-southeast from Big Island to Bulkhead or shoal west of Chicamacomico or south of said point more than two thousand yards from the shoals as marked on the United States Government chart, made from data obtained to November twenty-second, one thousand nine hundred and four, or shall set or fish any dutch or pound-net on the west side of Pamlico Sound in said sound extending into the water more than two thousand yards from the shore of the mainland; or shall set or fish any pound or dutch-net in Croatan Sound further from the shore than one-fifth the width of said sound at that point; or shall set or fish any pound or dutch-net in the Albemarle Sound more than two thousand yards from the shore of the mainland, or in Chowan River further from shore than one-third the width of said river at place where said nets are fished or set, or within one-fourth mile of any wharf used by a steamer on said river; or shall set or fish any net or appliance of any kind for catching fish within one mile on north or south side of a line five miles long running west from center of New Inlet or Oregon Inlet, or on north or south side of a line five miles long running northwest from center of Hatteras Inlet, he shall be guilty of a misdemeanor and be fined or imprisoned in the discretion of the Court. The provisions of this section shall apply only to that part of each year beginning January fifteenth and ending May fifteenth. The place of trial for offenses under this section shall be the county opposite where the act was committed. It shall be the duty of the Oyster Commissioner or Assistant Oyster Commissioner, whenever an affidavit is delivered to him stating that the affiant is informed and believes that this section is being violated at any particular place, to go himself or send a deputy to such place, investigate same, and he shall seize and remove all nets or other appliances setting or being used in violation of this section, sell same at public auction and apply proceeds of sale to payment of cost and expenses of such removal, and pay any balance remaining to the school fund of county nearest where offense is committed.

This law, owing to its radical provisions and its far-reaching effect upon a population devoted almost exclusively to fishing, has met with considerable opposition as regards certain provisions, in Dare County, to which it mainly applies.

The provision forbidding the setting of nets "within one mile on the north or south side of a line 5 miles long running west from center of New Inlet or Oregon Inlet, or on north or south side of a line 5 miles long running northwest from center of Hatteras Inlet" meets with almost unanimous approval. Part of this unanimity may be due, however, to the fact that at both Oregon and New Inlets the channels, a mile or two inside of the inlets, swing to the southeast and leave the closed area, and gill-nets set along them prove quite profitable, while at Hatteras Inlet the channel leaves the closed area about 1½ miles inside of the inlet, and as there is a shoal just east of the line, the fish are forced out towards Hatteras Inlet light where

the pound-nets are located. With the exception of Hatteras Inlet, no pound-nets have, in recent years, been located in this restricted area, but large numbers of gill-nets were set in the vicinity of New and Oregon Inlets, and these have all had to be removed outside the line. As gill-net fishing had been unprofitable for several seasons, a number of the dispossessed fishermen abandoned this form of fishing altogether this season.

Other provisions which meet with general approval are those forbidding the setting of nets in Pamlico Sound off the Roanoke Island or Hog Island shores, or more than 2,000 yards from the mainland shore on the western side of the sound. A glance at the two charts (for 1904 and 1906) showing the nets set in the first-named area will show the absolute necessity of the law in question. In 1904 the mouth of Croatan Sound was almost entirely blocked by the strings of pound-nets set off the Marshes shore, around Bunting's and Big Islands, and in Pamlico Sound a few miles off the Hog Island shore. As nearly all of the shad going north pass through Croatan Sound, this arrangement of nets virtually cut off the fish from the fishermen of Croatan and Albemarle sounds and the tributaries of the latter. Under the present law this passage is left entirely free, and it should be the first aim of the State to keep it so.

I found some objection to the provision forbidding the setting of nets "within a radius of two and one-half miles either way from Roanoke Marshes light-house at a distance more than 500 yards from the shore of Roanoke Island or the mainland on the western side of Croatan and Pamlico sounds." Under this provision those fishermen who had been setting their nets in the bays just south and north of the Marshes, within the restricted area, found themselves cut off by the long strings set just without the bounds. As the general desire was to prevent the setting of long strings in the narrow section where Pamlico and Croatan Sounds meet, no harm could result if the strings north and south of the Marshes were allowed to extend out in an easterly direction to the outer edge of the Marshes.

The chief objection I found to the law was as to the provision forbidding the setting of "any pound or dutch-net on the eastern side of Pamlico Sound within ten miles of the Roanoke Marshes light-house, * * * or shall set or fish any dutch or pound-net on the eastern side of Pamlico Sound more than 2,000 yards west of a line running south-southeast from Big Island to Bulkhead or shoal

west of Chicamacomico or south of said point more than 2,000 yards from the shoals as marked on the United States Government chart made from data obtained to November twenty-second, one thousand nine hundred and four." The principal point urged against this law was that it forced the fishermen so far down in the sound that they were compelled to employ power boats to go and return, while their employees had to work longer hours, and as a result many refused to work on these strings and sought employment with those better situated. As only a few nets can be set in the restricted area around the South end of Roanoke Island and Hog Island, and as the unrestricted areas in the vicinity were already occupied, some of the pound-netters have had to go as far south as Gull Island on the eastern side and to Middletown, in Hyde County, on the western shore. It is really questionable whether it is necessary for the preservation of the fisheries to block off such a large area. It should be stated, however, that a few fishermen (but none in the area affected) feel that this provision of the law is a necessary one. Should this area be thrown open again it might be well to hold the strings down to the 2,000-yard length, and also require that each string be set in practically a straight east and west line, with the hearts all opening in one direction. This would do away with the triangles and hooks now so popular, and give the shad a better chance for their lives.

Although stakes had been put in showing the restricted area to ten miles from the light, I found a number of strings set almost up to the 2½-mile area from the Roanoke Marshes light. A few fishermen lived strictly up to the law, very much to their financial loss. In the other restricted areas I found the law very generally obeyed.

The pound-netters south of Chicamacomico complain bitterly because of the law restricting them to 2,000 yards from the shoals. From Hatteras Inlet the "Banks" run in an almost due east course to Cape Hatteras, and from there they take a north and easterly course. The widest part of the sound is from the inside of Cape Hatteras to Long Shoal Point on the western shore, nearly 25 miles, and as the shoals on the eastern side do not extend out more than 6 or 7 miles, this leaves an area nearly 20 miles wide in which pound-nets cannot be set. The angle of the "Banks" makes a bight in this section in which shad are found in but slight numbers, as the fish from Hatteras Inlet go up the Sound some miles to the westward. But little, if any, damage would be done by remov-

ing all restrictions on the eastern side below Gull Island (except around Hatteras Inlet), as but few fishermen would set nets out near the middle of the sound, owing to the distance from camps and the danger of damage to their nets during the usually stormy spring months when fishing is carried on.

A few of the pound-net fishermen suggested to me that it would be much better for the shad fisheries if the pound-nets set in Pamlico and Croatan sounds were all of what is known as "shad-pound" mesh. This would allow the alewives and small fish to escape, and as the pound-netters in this region are after shad principally, not having the labor available to handle alewives profitably, it would allow all of the latter and also all other small fish to escape. If this were done in the fall it would allow the young shad to escape, and thus prevent the destruction now going on in the latter species during the fall fishing.

Some fishermen claim that shad frequently spawn in Pamlico Sound. While this might occur under unusual conditions, such as extreme freshness of the waters of the sound or long-continued cold winds from the northwest, it would be an exceptional occurrence under ordinary conditions, as is shown by the large numbers which go up into Albemarle Sound, the favorite spawning ground of the shad; also by the fact that the pound-netters report the catch of but few shad in a ripe condition.

An impression exists among some of the fishermen that shad winter in the sounds, and in confirmation of this they point to the fact that shad are very rarely seen going through the inlets, which would be an easy matter to observe in daylight, owing to the clearness of the water in these narrow places, and also that shad taken in gill-nets near the inlets are generally found with their heads pointing towards the ocean, thus showing that they had gilled on the far side of the net. This contention is not borne out, however, by the experience of those pound-netters who set their nets in the sound during the fall months. While quite young shad are frequently taken in these, it is rare to find a mature one in them. It is also probable that shad are not observed coming through the inlets, as at that time they have not yet begun to school, and it is also probable that many come through at night.

NEUSE RIVER AND TRIBUTARIES.

The Neuse River is formed in Durham County, N. C., by the junction of the Eno, Flat, and Little rivers, and from that point to New Bern is a distance, following the windings of the stream, of 260 miles. In the 40 miles of river below New Bern it widens very much and becomes virtually a broad arm of Pamlico Sound. Its principal tributaries are the Trent, Contentnea, and Little rivers. Formerly, shad ascended this river to its uppermost limits, and extensive fisheries are said to have existed near Raleigh, 190 miles from New Bern. At present, however, commercial fishing does not extend above Goldsboro, although considerable fishing for home use is prosecuted above that city. For purpose of comparison with the canvass of 1896 the shad fisheries of this river are divided into two geographical sections, viz.: (1) the lower, 72 miles from Pamlico Sound to Contentnea River, and (2) from Contentnea River to the headwaters.

FROM THE MOUTH TO CONTENTNEA RIVER.

From New Bern to the mouth, the river ranges in width from 6 to $1\frac{1}{2}$ miles, and from New Bern to the Contentnea it is from 250 to 80 feet wide at low water. The forms of apparatus used in this section of the river are seines, drift and stake gill-nets, pound-nets, and bow-nets. All but a few of the seines are operated at regular beaches, the others being hauled at places where it seemed fishing would be most successful. In 1896 there were 5 seines operated for shad on the river between New Bern and the mouth; in 1906 there was but 1 used. This seine was 1,000 yards in length, 14 feet deep, with stretch-mesh of $2\frac{1}{2}$ inches in the bunt, and from $2\frac{3}{4}$ to 3 inches in the balance. It was hauled by 6 men and 2 mules. The seine at Johnsons Point was operated at a loss in 1905 and then abandoned. Between New Bern and Cowpen Landing 9 seine-beaches (1 on Bachelors Creek), with 11 seines, were operated in 1906. At two of the beaches 2 seines each were operated in the busy season. The seines in this reach range from 150 to 300 yards in length. In the whole section from the mouth to Contentnea River there were 17 seines operated in 1906 as compared with 13 in 1904 and 86 in 1896. The catch of shad in these seines amounted to 105,210 in 1896 and 5,672 in 1904, a decrease of 99,538 fish.

The stake gill-nets used in the Neuse River are set in strings of about 20 each. They are each about 20 yards long, $5\frac{1}{4}$ -inch stretch mesh, 30 to 40 meshes deep, and cost about \$1. The favorite spots for stake-nets are just below the road bridge at New Bern, some of the nets being tied at one end to the piling of the bridge, between Upper Broad Creek and Goose Creek, off the mouth of Slocums Creek, and close to Cherry Point. In 1906, 3,232 of these nets were set; in 1904, 3,600; and in 1896, 3,240. In 1896 the number of shad secured in these nets was 23,118, and in 1904, 18,514, a decrease of 4,604. Usually these nets are operated until the early part of April, but at the time of my visit to the Neuse (about the middle of March) nearly all that had been set in the lower reaches of the river had been taken out, owing largely to the small catch up to that time and to the ravages of crabs. This form of apparatus was interdicted by law for many years.

Drift gill-nets are operated generally between Bachelor Creek, 4 miles above New Bern, and Thoroughfare, $9\frac{1}{2}$ miles from New Bern. These nets averaged about 110 yards in length, with stretch mesh of $5\frac{1}{4}$ inches. In 1906, 20 drift-nets were used; in 1904, 10; and in 1896, 38. The number of shad taken in this form of apparatus in 1896 was 18,485, while in 1904 but 800 were secured, a decrease of 17,685.

The pound-net was first introduced in the Neuse River about 1878. In 1880, 6 were reported, and by 1896 this number had increased to 86, set on both sides of the river. In 1904 there were 77 in use, all located on the north side of the river in Pamlico County, a law forbidding their use elsewhere on the river. The "leads" to these nets average about 200 yards in length, and the mesh in the traps is from 2 to $1\frac{1}{2}$ inches. They are usually put in the water in August or September and allowed to remain in until May. The number of shad taken in this form of apparatus in 1896 was 22,471, and in 1904 it amounted to but 7,392, a decrease of 15,079. There was also a decrease of 10 in the number of nets employed.

Only 15 bow-nets were used in this section in 1906 as compared with 26 in 1904 and 185 in 1896. The catch of shad in this form of apparatus in 1896 was 12,250, while in 1904 the number taken amounted to but 1,360, a decrease of 10,890.

The season of 1906 was somewhat better than that of 1905, but even then shad were quite scarce as compared with the earlier seasons. This year what fish did come up the river appeared late in the season. Alewives were also more plentiful than in 1905, which was a very bad season.

FROM CONTENTNEA RIVER TO GOLDSBORO.

In this stretch of river during 1906, 8 seines and 117 bow-nets were employed in the shad fisheries, as compared with 12 stake gill-nets, 7 seines, and 170 bow-nets in 1904; and 6 stake gill-nets, 12 seines, and 257 bow-nets in 1896. In the last-named year the canvass was extended to the headwaters, which explains the large number of bow-nets for that year. Seines were operated in 1906 as far up the river as Bear Creek, 69 miles from New Bern. The catch of shad in this stretch of river in 1896 was as follows: In stake-nets, 824; in seines, 6,108, and bow-nets, 11,067. In 1904 the catch of shad by apparatus was as follows: In stake-nets, 206; in seines, 996; in bow-nets, 3,324. All show a decrease for 1904 as compared with 1896.

CONTENTNEA RIVER.

This river enters the Neuse about 32 miles above New Bern, is 140 miles long, and is navigable as far as Stantonburg, 63 miles above the mouth. The apparatus used in taking shad in this river consists of seines, stake gill-nets, and wheels. The seines run from 30 to 85 yards in length, with mesh from 2 to $3\frac{1}{2}$ inches. The stake-nets average about 10 yards in length, with mesh of $5\frac{1}{2}$ inches, and are set between Gaskins and McCarters landings. There were also 8 wheels in operation a few miles above and below Stantonburg. In this latter fishery rows of saplings sunk in the stream and banked with brush are run out from both banks until they are within about 5 feet of each other. In this narrow opening the wheel is placed. This comprises two broad frameworks, like paddles, to which net-bags are attached, the whole looking like two dip-nets attached to an axle. By means of a rude sort of windlass attached to the axle, the paddles are turned by hand, and as the current aids very materially when one of the paddles is in the water, it requires very little strength to operate. When not in use the axle is turned until both paddles are out of the water and then clamped in this position. This brings them so far above the surface that a rowboat can

pass under the paddles through the opening. As an appropriation has been secured for the improvement of the Contentnea, and these wheels were an obstruction to navigation, the United States engineer in charge of the work ordered their removal. They should be prohibited by law also.

In 1896 there were 178 stake gill-nets, 10 seines, and 70 bow-nets operated for shad; in 1904, 100 stake gill-nets, 7 seines, and 44 bow-nets, and in 1906, 48 stake gill-nets, 4 seines, and 8 wheels so operated. In 1896 the catch of shad by apparatus was as follows: In stake gill-nets, 2,541; in seines, 2,573, and in bow-nets, 1,919. In 1904 the catch of shad was as follows: In stake gill-nets, 910; in seines, 1,510, and in bow-nets, 771.

LITTLE RIVER.

About 2 miles above Goldsboro the Neuse receives the waters of Little River, which is nearly 100 miles long. No effort was made to cover this stream more than a few miles from its mouth, where some fishing was carried on by Goldsboro parties. Three stake gill-nets, 30 yards long, were set about $2\frac{1}{2}$ miles from its mouth.

RECOMMENDATIONS AS TO THE NEUSE RIVER AND TRIBUTARIES.

The use of two seines at the same time in one fishing-hole should be prohibited. The use of wheels should be prohibited. It seems to me that far too many stake gill-nets are set in the immediate vicinity of the road bridge at New Bern.

PAMLICO-TAR RIVER.

Pamlico River is only the estuary of the Tar River, the name changing just above the town of Washington. The Pamlico River portion has a length of 37 miles, with a maximum width of 4 miles and a minimum width of about 1-3 of a mile at Washington. The Tar River is 180 miles long, thus giving a total length for both portions of 217 miles. Tarboro, 49 miles above Washington, is the present head of navigation. Shad ascend as far as Rocky Mount, where a natural fall obstructs their farther advance.

By far the greater part of the fishing is prosecuted in the Pamlico River section, and drift and stake gill-nets, pound-nets, and seines are the forms of apparatus employed.

The 12 drift gill-nets used in 1906 averaged 100 yards in length and were operated in front of Washington.

The stake gill-nets are about 20 yards in length, 10 to 12 feet deep, with $5\frac{3}{8}$ to $5\frac{1}{2}$ -inch mesh, and about 20 are set in a string. They are scattered all along the river from Redmans Point to opposite Sinclairs Creek; Blount Bay and the vicinity of Mauls Point are the favorite spots for setting these nets. In 1896, 840 of these nets were used and took 8,114 shad. In 1904, 1,315 were employed, and took 6,576 shad. In 1906, 1,500 nets were set. This shows a constant increase in the number of nets, but a steady decrease in the catch. Sand-fleas were especially destructive to the nets during 1906, many of the nets being destroyed by them, and at the time of my visit (shortly after the middle of March) only a few strings were in the water.

Seines in the Pamlico River are operated from Mauls Point to the town of Washington. In 1906, 12 were operated in this section, 7 being on the south side of the river, 3 on the north side, and 2 being hauled to islands in the river. These seines range from 350 to 800 yards in length, with meshes from 2 to $2\frac{1}{2}$ inches. The season usually begins early in February below Washington, and about 2 weeks later in the upper portions of the river. In 1896, 23 seines were used on the Pamlico and took 32,178 shad; while in 1904, 16 seines were employed and took 9,840 shad, showing a decrease of 7 seines and 22,338 shad. In 1906, 12 seines were operated.

In 1896, 27 pound-nets were set near the mouth of the Pungo River. An interdiction existed against the use of this form of apparatus at that time, but it was "more honored in the breach than in the observance." In 1903 the Legislature authorized their use in the Pamlico River "below a line beginning on the southern shore of Pamlico River at Mauls Point, and running due north to a point on the northern shore of said river: *Provided*, that no dutch, pod, pyke, or pound-net, or other net of like kind, shall extend out in said river more than one-eighth of the distance across said river from the shore, and that none of said dutch, pod, pyke, or pound-nets shall be set, placed down, or fished nearer to each other than five hundred yards, measuring up and down the river; nor shall they be placed, set down, or fished within five hundred yards of any seine-beach in actual use for hauling a seine, nor within one mile of the mouth of Bath Creek: *Provided*, no nets of the kind enumerated in this

section, or other nets of like kind, shall be placed down, set, or fished in said rivers between the tenth day of May and the first day of July in any year." As there has been considerable objection to the use of pound-nets in this river, I made an especially careful examination of those set during the season of 1906, and am forced to confess that they seem to be less of an obstruction to the ascent of the shad than on any other river and sound where their use is authorized by law. No string has more than 4 nets upon it, while the majority have but 2 and 3, and the law about not running them out more than $\frac{1}{8}$ of the width of the river seems to be rigidly obeyed. The section forbidding the setting of these nets within 1 mile of the mouth of Bath Creek is not observed, however. During 1906, 165 pound-nets were set in the Pamlico River, but up to the time of my visit they, as well as the gill-netters, had caught very few shad. In 1904 there were 190 pound-nets set and these took 19,075 shad, a very small catch for such a large number of nets.

TAR RIVER.

From Washington to Greenville, a distance of 22 miles, 9 seine-beaches were operated in 1906. As the season had been so poor up to the time of my visit, one or two were in doubt about operating, but as they had made ready they have been included. The above is a decrease of 2 as compared with 1904, and of 1 as compared with 1896. These nets range in length from 100 to 400 yards. In 1896 the 10 seines secured 6,515 shad, while in 1904 the 11 seines secured 9,840, a gain of 3,325. Judging from the limited data obtainable the seines operated on the Tar River have held their own better than on any other river in the State.

Bow-nets are operated at favorable points above Washington. In 1896, 98 were operated; in 1904, 174; and in 1906, 60. The number of shad secured in these in 1896 was 6,285, and in 1904 was 3,620.

PUNGO RIVER.

The Pungo River is a short and broad tributary of Pamlico River. In 1896 there were set 24 pound-nets near the mouth of the river, a decrease of 10 as compared with 1904, when 34 were set. These nets are similar to those operated in the Pamlico River.

CROATAN SOUND.

This sound, which forms the principal means of communication between Pamlico and Albemarle sounds, is 10 miles long, $2\frac{1}{2}$ to 4 miles wide, and averages 8 to 10 feet deep, the bottom being very uneven. Roanoke Island forms its eastern shore and the mainland the western. Nearly all of the shad passing north from Pamlico Sound traverse Croatan Sound.

The pound-net is the only apparatus of importance set for shad. The western shore is lined with strings of nets, reaching out 1-5 the width of the sound, while but few are operated on the eastern shore. These are operated by people from Callahans Creek, Manns Harbor, and Peter Mashoes Creek on the mainland, and from Skyco on Roanoke Island. The nets are similar to those operated in the north-eastern end of Pamlico Sound. In 1896 there were 140 pound-nets operated in this sound; in 1904, 200; and in 1906, 190. The number of shad taken in these pound-nets in 1896 was 73,834, and in 1904, 72,860. The average number of shad per net in 1896 was 527, and 1904, 364, thus showing a very material decrease per net.

In 1906, 1,478 stake gill-nets, of the same length and style as those operated in Pamlico Sound, were set in Croatan Sound. The number of these set shows a steady decrease, as in 1896, 5,625 were set, and in 1904, 2,550. The former gill-netters are now most of them pound-netters. In 1896 the catch of shad in gill-nets numbered 68,626; while in 1904 the number had decreased to 4,898. The catch per net in 1896 was 13, while in 1904 it had decreased to slightly under 2 to the net.

ROANOKE SOUND.

Roanoke Sound runs parallel to Croatan Sound and is separated from the latter by Roanoke Island. It is about 10 miles in length, from 1 to 2 miles wide, and very shoal except in a narrow channel skirting the shore of the island. But few shad pass through Roanoke Sound, the favorite passage being Croatan Sound.

Only 270 stake gill-nets were set in this sound in 1906 and nearly all off the extreme northern end of the island. There were 46 pound-nets operated in the sound in 1906 and all but 2 of these were between Ballast Point and N. W. Point of Roanoke Island. In 1896, 225 stake gill-nets were operated; in 1904, 1,950, and in 1906, 270. The number of shad taken in these nets in 1896 was

5,000, and in 1904 the number was 1,560; the average per net in 1896 being 22, while in 1904 it was less than 1 to the net. In 1896, 3 pound-nets were set, and in 1904, 43. The catch of shad per net in 1896 was 694, but in 1904 it had dropped to 63 to the net.

ALBEMARLE SOUND AND TRIBUTARIES.

The magnificent sheet of water known as Albemarle Sound stretches east and west from the coast to a distance of nearly 60 miles, and is said to be the largest coastal body of fresh water in the world. In width it averages 7 or 8 miles and has an area approximating 450 square miles. The only tides on this sound are those caused by the winds, and these are of infrequent occurrence, while it is wholly free from strong currents. Its depth is quite uniform, averaging from 16 to 20 feet.

Stake and anchored gill-nets, seines and pound-nets are the forms of apparatus operated for shad. The principal fishing centers on the sound are Powells Point, Peter Mashoes Creek, Holloways Pier, Pear Tree Point, Leonards Point, Mackeys Ferry, and Edenton. Edenton, Hertford, and Elizabeth City are the principal shipping points.

The anchored gill-nets in 1906 numbered 299, with a total length of 39,150 yards, and a value of \$3,937. The greater part of these nets are set in the sound west of the Perquimans River. The only difference between these nets and stake gill-nets is that the former are anchored at each end instead of being secured by stakes, as is the case with the latter. The catch of these nets has been combined with the stake gill-net catch.

The stake-nets operated in this sound are of the same length and style as those described for Pamlico Sound. These nets are set principally on the south side of the sound between Laurel Point and the Alligator River, and on the north side east of Little River. The eastern end of the sound is also a favorite spot. In 1896, 21,985 of these nets (including anchored nets also) were set in the sound and they caught 429,599 shad, an average of $19\frac{1}{2}$ fish to the net, while in 1904, 12,909 nets were operated and caught 61,954 shad, or an average of about $4\frac{1}{2}$ fish to the net. In 1906 there were 13,215 (299 of which were anchored nets) in use, and owing to the muddy water they did fairly well. In 1896 the stake-net fishery was the

most important, but in 1904 the pound-net fishery had achieved the pre-eminence.

The pound-nets in Albemarle Sound are almost essentially the same as those in Croatan and Pamlico sounds. While quite a few are set between Peter Mashoes Creek and Durants Island, on the south side, and at Powells Point, at the eastern end, the great body of them are located in the western half, west of Little River on the north and the Scuppernong River on the south. Some of the longest strings in the State are located in this section. These nets were first introduced in Albemarle Sound in 1870. In 1880 there were 117 in use, in 1896 the number had increased to 612, in 1904 they numbered 714, and in 1906 there was a slight decrease, only 661 being set. The catch in 1880 was 920,360 shad, an average of 7,866 to the net; in 1896 the catch amounted to 173,380 shad, an average of 283 to the net; and in 1904, 69,848 shad were taken, an average of 98 to the net. The pound-nets did very poorly in 1906.

Until about 1860 haul-seines were the only form of apparatus used for shad, and for some years later they were the principal apparatus. Owing to the expense of operating them as compared with gill-nets and pound-nets, they gradually dropped off until in 1906 there were but 3 in operation on the sound—at Drummonds Point and Greenfield in Chowan County, and at Avoca in Bertie County. These seines are among the largest in the country, averaging 2,500 yards each in length. The meshes in the wings range from $2\frac{1}{2}$ to 4-inch stretch, and in the bunt 2-inch stretch mesh. The laying out of the seine is done by means of steam flats. In 1896 there were 4 seines operated on the sound and these secured 132,213 shad, or an average of 33,053 to the net. In 1904, 3 were operated and secured 47,084 shad, or an average of 15,694 shad to the net—less than $\frac{1}{2}$ of the average of 1896.

NORTH RIVER.

This is a short but comparatively wide river emptying into the eastern part of Albemarle Sound. In 1904, 14 pound-nets were operated in this river, and in 1906, 13. The catch of shad in 1904 was only 700, this river being frequented but little by this species.

PASQUOTANK RIVER.

This is really an arm of Albemarle Sound, extending 15 miles inland, with an average width of 2 miles and a depth of 10 or 12 feet. In 1896 there were 100 stake gill-nets, 17 pound-nets, 4 seines and 10 minor nets operated for shad; in 1904 there were 100 stake gill-nets and 44 pound-nets set, and in 1906, 47 pound-nets. In 1896 the catch of shad in stake-nets was 1,000; in pound-nets, 2,840; in seines, 4,642, and in minor nets, 275. In 1904 the catch in stake-nets was 130 shad and in pound-nets, 1,100. The run of shad in this river is slight and most of the above apparatus is set for alewives and other species, rather than for shad.

LITTLE RIVER.

This is quite a short stream emptying into the sound between the Pasquotank and Perquimans rivers. Shad go up it in limited numbers and the pound-nets set in it in 1906 were principally for other species. In 1904, 40 stake-nets, 26 pound-nets, and 1 seine took shad, while in 1906 there were but 22 pound-nets set during the shad seasons.

PERQUIMANS RIVER.

This is also an arm of Albemarle Sound, 12 miles long, and averaging over a mile in width. Next to the Chowan River this is the most important stream on the north side of the sound up which the shad ascend. In 1896, 765 stake-nets, 71 pound-nets, and 2 seines, caught some shad, the number taken in the stake-nets being 12,428, in the pound-nets 12,718, and in the seines 7,680, a total of 32,822. In 1904, 210 stake-nets took 1,750 shad and 136 pound-nets caught 10,500 shad, a total of 12,250, or a decrease of 20,572.

YEOPIM RIVER AND CREEK.

In 1904, 52 pound-nets set in the river caught 4,000 shad. In 1906 there were 46 pound-nets set in the river and 5 in the creek. Shad forms but a small part of the total catch of these nets.

CHOWAN RIVER.

The Chowan is formed by the junction of the Blackwater and Nottoway rivers nearly on the line between North Carolina and

Virginia. From the junction to its mouth is a distance of about 55 miles. For the lower 20 miles the river averages about $1\frac{3}{4}$ miles in width, and the water is dark and clear. For a few miles above Coleraine the greater part of the river is filled with stumps, while above Hollidays Island the river narrows very much. This river is most noted for its alewife fisheries, the shad catch being very small when one considers the quantity of apparatus used.

Seines, drift and stake gill-nets, and pound-nets are the only forms of apparatus used.

There were formerly a large number of seines on the river, but the unprofitableness of seine fishing, and the lesser cost of operating pound-nets, has led to the abandonment of many of them. In 1896 8 seines were operated and secured 60,450 shad, while 4 were operated in 1904 and secured but 3,885 shad, an average of 7,556 per net in 1896, and of 971 per net in 1904. In 1906 but 3 seines were operated, and all of these were above Hollidays Island.

The Chowan River has the largest number of pound-nets in use of any river in the country, the number in 1906 being 872. In 1896 there were 447 in operation, and in 1904, 833. There is a regular network of nets from the mouth to Tunis, occupying about 2-3 of the river. From Whites Landing to Hollys Wharf a large number are set in the middle of the river in addition to those running out from both shores. The law permits the pound-netters to run their strings out to 1-3 the width of the river. One string of 9 nets at Willow Branch came prominently to my notice, owing to the complaints of some of the fishermen that it extended out almost to the center of the river, and my eye observation bore out their complaint. In 1896 the 447 pound-nets caught 122,595 shad, an average of about 274 to the net; in 1904 the 833 nets secured 13,869 shad, an average of about 17 to the net.

A few stake gill-nets, similar to those in the sound, are set near the mouth. There were 60 of these in 1904 and 120 in 1906.

In the vicinity of the railroad bridge at Tunis 74 drift gill-nets were drifted in 1896, 99 in 1904, and 102 in 106. They averaged 18 yards in length.

ROANOKE RIVER.

The Roanoke River is the principal tributary of Albemarle Sound, and is a narrow stream, with very rapid current. It rises in Virginia and from the confluence of the Dan and Staunton in Virginia is 198

miles to its mouth. The water of the Roanoke is very muddy and can be traced for many miles after emptying into the sound, by its dingy yellow color.

The commercial shad fisheries are confined quite largely to that portion of the river from the mouth to Williamston. The forms of apparatus employed are seines, bow-nets, drift gill-nets, and wheels.

The seines catch slightly more than $\frac{1}{2}$ of the shad obtained, although they formerly secured over 80 per cent. Seines are operated at Jamesville and from 2 miles above Plymouth to the mouth. The waters of the Roanoke debouch into the sound through three mouths—the Roanoke proper, Middle River and Cashi River combined, and the Eastmost River. Below Plymouth 2 of the fisheries are on the Roanoke, 1 on the Middle River, and 2 on the Cashi River. In 1896, 8 seines were operated and secured 60,450 shad, an average of 7,556 to the net; while in 1904, 8 seines secured 8,200 shad, an average of 1,025 to the net. In 1906, 9 seines were operated. The presence of so many nets near the mouth of such a narrow stream as the Roanoke would appear on the surface as excessive, but nature has put such limits upon their operations as amply protect the stream itself. Freshets are quite frequent on the river, and when these occur it is impossible to operate the seines, thus permitting the shad an unobstructed passage up the river.

A few gill-nets, 18 in 1896, 7 in 1904, and 8 in 1906, are drifted in the vicinity of Plymouth, but the fishery is very insignificant now, 4,000 shad having been secured in 1896 and but 220 in 1904.

A number of wheels are operated close to shore on both sides of the river, but as they only extend out about 12 feet they do no damage to the shad fisheries. A number of bow-nets are also fished at various places along the river as far up as Weldon. In 1896 there were 510 wheels and bow-nets operated and these caught 15,500 shad. In 1904, 126 were operated and caught 6,390 shad. In 1906, 114 were operated.

SCUPPERNONG AND ALLIGATOR RIVERS.

On the south side of the sound are the Scuppernong and Alligator rivers, in which are carried on extensive pound-net fisheries for alewives, but the number of shad which enter these rivers is exceedingly small, so these nets have not been included in the tables.

The shad fisheries of Albemarle Sound and its tributaries are in a very bad way at present. If this were a temporary condition, due to local adverse conditions prevailing for one, or possibly, two seasons, it might be hoped that matters would soon adjust themselves, and the fish return in as great numbers as formerly; but all information available points steadily in one direction, viz., the shad are not caught in anything like such abundance as say, from five to ten years back, simply because they are not in North Carolina waters to be caught. The fishermen of the sound are thoroughly awake to this fact, and are seeking a remedy. Unfortunately, they have cast their eyes away from home, as is but human, and have failed to notice, or blinded themselves to the conditions prevailing in their own vicinity. For a time the great cry was to "clear the inlets!" The inlets were thoroughly clear last season, and there was but little to prevent the shad from ascending if they so desired, and what was the result? A season as bad, if not worse, than the preceding ones. It is useless to contend that the fishermen in Dare County are solely to blame for the present depleted condition of the fisheries; the blame lies almost as much upon the fishermen of western Albemarle Sound and its tributaries. During the season of 1906 the fishermen of Albemarle Sound and its tributaries operated 1,813 pound-nets, more than were operated in the whole of Virginia in 1904. The greater part of this large number of pound-nets is massed in the western end of the sound and in the Chowan River, on the principal spawning beds. Far be it from me to recommend the abolishment of the pound-net, which can ill be spared in this age of advancement; but something must be done to reduce the enormous number now being set in the sound and its tributaries if it is ever hoped to build up the shad fisheries again. Not content with running out the numerous strings of pound-nets in the narrow portion of western Albemarle, many of the owners also set out long strings of anchored gill-nets in the portions of the sound where pound-nets are not permitted. It would possibly be well to abolish the anchored gill-net altogether in this sound. Such a prohibition would fall but lightly on the fishermen, as nearly all of the owners of such nets are also pound-netters. The conditions in the eastern section of the sound are not so bad as in the western, as but few nets are set in this section, and it is also much wider than the other.

The alewife fishery, which is very important on this sound and its tributaries, is also in bad shape, the decrease in this species being as marked as in that of the shad. As the greater part of these are taken in pound-nets and seines, with the shad, anything that will benefit the shad fisheries will work also for the benefit of the alewife.

GENERAL RECOMMENDATIONS.

ENFORCEMENT OF THE LAW.

As the law is at present constituted, it is quite difficult of enforcement in many instances. The procedure to be followed under the more important clauses is as follows: Some person must make an affidavit that he is informed and believes that the law is being violated at some particular place. This affidavit must be delivered to the Oyster Commissioner or Assistant Oyster Commissioner, whose duty it shall be "to go himself or send a deputy to such place, investigate same, and he shall seize and remove all nets or other appliances setting or being used in violation of this section, sell same at public auction and apply proceeds of sale to payment of cost and expenses of such removal, and pay any balance remaining to the school fund of the county nearest to where offense is committed." One of the most serious objections to this method of procedure is that in a strictly fishing community the odium attached to informing against violators of the fishing laws would prevent a person from making such an affidavit as required above unless he was being directly injured by the violation. Another objection is that the burden of prosecuting the suit is imposed upon the Oyster Commissioner. At present this official is compensated from a fund made up of license fees paid by the oystermen, and the latter object most decidedly to the oyster fees being diverted to the protection of the fisheries, which contribute not one penny towards this fund. The law provides, of course, for the payment of the expenses of suit out of the sale of the offending apparatus, but if the owner should fight the matter in the courts the expense of litigation might exceed the amount realized from such sale if the suit resulted in favor of the State, while if the suit is decided in favor of the fishermen the whole expense of the suit would be saddled upon the oyster fund. This is not just to the oystermen, as all of the license fees paid by them, over and above what is expended in the compensation of officials appointed to en-

force the oyster laws, is supposed to be expended in the direct work of bettering the condition of the oyster beds.

What the State of North Carolina needs is a commission of one or more practical men appointed for the sole purpose of conserving its fisheries. The fisheries of the State are of vast importance to its prosperity and too much cannot be done to foster them. During my investigation I found an almost unanimous sentiment in favor of such a commission, and a quite general willingness on the part of the fishermen to support it by means of license fees, as is now being done in the case of the oyster fishery.

EARLY CLOSING OF SEASON.

At present shad fishing is permitted on the Cape Fear River as late as May 15th; in Pamlico County on the Neuse River until May 1st, and along the balance of the river until May 15th, while dutch or pound-nets are allowed in the Pamlico River until May 10th. Throughout the rest of the State there are practically no restrictions upon the length of time the shad fishermen shall work. It is, of course, obvious that the late runs of shad comprise the ripest females, and these are the ones which should receive the most protection. After the middle of April there is but little profit to the fishermen in shipping shad, as the northern markets are then well supplied with fish from Chesapeake and Delaware bays, and the price is necessarily quite low. If these late shad were permitted to spawn unmolested by man they would undoubtedly benefit the fishery wonderfully, and I would recommend that this be done. The fishermen along the upper reaches of the river could be permitted to work from a week to ten days longer than those near the mouths or in the sounds, as it would take about that length of time for the last run upon which the latter had worked to reach the upper courses of the rivers. I would suggest the following basis upon which to work:

Cape Fear River.—All shad apparatus below the mouth of Black River to be out by April 20th; all above this point to be out by May 1st.

Northeast Cape Fear River.—All shad apparatus below Castle Hayne to be out by April 20th, and all above that point to be out by May 1st.

Black and other tributaries of the Cape Fear River.—All shad apparatus to be out by May 1st.

Neuse River.—All shad and alewife apparatus operated at or below the town of New Bern to be out by April 20th, and all above that town to be out by May 1st.

Pamlico and Pungo River.—All shad and alewife apparatus to be out by April 20th.

Tar River.—All shad and alewife apparatus to be out by May 1st.

Pamlico, Roanoke and Croatan Sounds.—All shad and alewife apparatus to be out by April 20th.

Albemarle Sound and Tributaries.—In that portion of the sound east of the Perquimans River on the north and Ship Point on the south, all netting to be out by April 20th (this to apply also to the tributaries of the sound in this section). West of the above points and in the tributaries of that portion of the sound all netting to be out by May 1st.

LOCATION OF FIXED SHAD APPARATUS.

As ordered, I plotted on government charts all the fixed apparatus (except stake gill-nets) used for shad during the season of 1906, and copies of these charts are attached hereto. It should be distinctly understood that the location of these nets, and the distance each string is run from the shore or shoal, is merely approximate, as it would have required the services of a surveyor and a long period of time to have shown the exact location and length of each string, and the time during which they are in the water is too limited for that. The stake gill-nets are not shown because of their large number in certain places, and the impossibility of plotting them in the limited space available on even the largest scale chart issued by the government. The main Cape Fear River is not included because only gill-nets and a very few seines were operated on the river. Whenever possible, sections of the rivers in which no fixed apparatus was set have been omitted in order to reduce the number and size of the charts as far as possible. Copies of charts showing the location of fixed apparatus set for shad in the Neuse, Pamlico, and Pungo rivers, Pamlico, Croatan, and Roanoke sounds, and Albemarle Sound and tributaries for the season of 1904, are also included in order that the changes made in two seasons from natural causes, and from the operation of the Vann law, may be shown.

PUBLICATIONS OF THE NORTH CAROLINA GEOLOGICAL SURVEY.

BULLETINS.

1. Iron Ores of North Carolina, by Henry B. C. Nitze, 1893. 8°, 239 pp., 20 pl., and map. *Postage 10 cents.*
2. Building Stone in North Carolina, by T. L. Watson and F. B. Laney in collaboration with George P. Merrill. *In press.*
3. Gold Deposits in North Carolina, by Henry B. C. Nitze and George B. Hanna, 1896. 8°, 196 pp., 14 pl., and map. *Out of print.*
4. Road Material and Road Construction in North Carolina, by J. A. Holmes and William Cain, 1893. 8°, 88 pp. *Out of print.*
5. The Forests, Forest Lands and Forest Products of Eastern North Carolina, by W. W. Ashe, 1894. 8°, 128 pp., 5 pl. *Postage 5 cents.*
6. The Timber Trees of North Carolina, by Gifford Pinchot and W. W. Ashe, 1897. 8°, 227 pp., 22 pl. *Postage 10 cents.*
7. Forest Fires: Their Destructive Work, Causes and Prevention, by W. W. Ashe, 1895. 8°, 66 pp., 1 pl. *Postage 5 cents.*
8. Water-powers in North Carolina, by George F. Swain, Joseph H. Holmes and E. W. Myers, 1899. 8°, 362 pp., 16 pl. *Postage 16 cents.*
9. Monazite and Monazite Deposits in North Carolina, by Henry B. C. Nitze, 1895. 8°, 47 pp., 5 pl. *Postage 4 cents.*
10. Gold Mining in North Carolina and other Appalachian States, by Henry B. C. Nitze and A. J. Wilkins, 1897. 8°, 164 pp., 10 pl. *Postage 10 cents.*
11. Corundum and the Basic Magnesian Rocks of Western North Carolina, by J. Volney Lewis, 1895. 8°, 107 pp., 6 pl. *Postage 4 cents.*
12. Drinking Water Supplies in North Carolina, by Joseph A. Holmes. *In preparation.*
13. Clay Deposits and Clay Industries in North Carolina, by Heinrich Reis, 1897. 8°, 157 pp., 12 pl. *Postage 10 cents.*
14. The Cultivation of the Diamond-back Terrapin, by R. E. Coker, 1906. 8°, 67 pp., 23 pl., 2 figs. *Postage 5 cents.*
15. Mineral Waters of North Carolina, by F. P. Venable. *In press.*
16. A List of Elevations in North Carolina, by J. A. Holmes and E. W. Myers. *In preparation.*
17. Historical Sketch of North Carolina Scientific and Economic Surveys; and Bibliography of North Carolina Geology, Mineralogy and Natural History, by J. A. Holmes and L. C. Glenn. *In preparation.*
18. Road Materials and Construction, by Joseph A. Holmes and William Cain. *In preparation.*
19. The Tin Deposits of the Carolinas, by Joseph Hyde Pratt and Douglass B. Sterrett, 1905. 8°, 64 pp., 8 figs. *Postage 4 cents.*
20. The Loblolly Pine in Eastern North Carolina, by W. W. Ashe. *In preparation.*

ECONOMIC PAPERS.

1. The Maple-Sugar Industry in Western North Carolina, by W. W. Ashe, 1897. 8°, 34 pp. *Postage 2 cents.*

2. Recent Road Legislation in North Carolina, by J. A. Holmes. *Out of print.*
3. Talc and Pyrophyllite Deposits in North Carolina, by Joseph Hyde Pratt, 1900. 8°, 29 pp., 2 maps. *Postage 2 cents.*
4. The Mining Industry in North Carolina During 1900, by Joseph Hyde Pratt, 1901. 8°, 36 pp., and map. *Postage 2 cents.*
5. Road Laws of North Carolina, by J. A. Holmes. *Out of print.*
6. The Mining Industry in North Carolina During 1901, by Joseph Hyde Pratt, 1902. 8°, 102 pp. *Postage 4 cents.*
7. Mining Industry in North Carolina During 1902, by Joseph Hyde Pratt, 1903. 8°, 27 pp. *Postage 2 cents.*
8. The Mining Industry in North Carolina During 1903, by Joseph Hyde Pratt, 1904. 8°, 74 pp. *Postage 4 cents.*
9. The Mining Industry in North Carolina During 1904, by Joseph Hyde Pratt, 1905. 8°, 95 pp. *Postage 4 cents.*
10. Oyster Culture in North Carolina, by Robert E. Coker, 1905. 8°, 39 pp. *Postage 2 cents.*
11. The Mining Industry in North Carolina During 1905, by Joseph Hyde Pratt, 1906. *In preparation.*
12. Investigations Relative to the Shad Fisheries of North Carolina, by John N. Cobb. *Postage 4 cents.*

REPORTS ON RESOURCES.

- Vol. 1. Corundum and the Basic Magnesian Rocks in Western North Carolina, by Joseph Hyde Pratt and J. Volney Lewis. *Postage 32 cents.*
- Vol. 2. Fish and Fisheries in North Carolina, by H. M. Smith. *In press.*
- Vol. 4. Miscellaneous Mineral Resources in North Carolina, by Joseph Hyde Pratt. *In preparation.*

These publications are mailed to libraries and to individuals who may desire information on any of the special subjects named, free of charge, except that in each case applicants for the reports should forward the amount of *postage* needed, as indicated above, for mailing the bulletins desired, to the *State Geologist, Chapel Hill, N. C.*

BUREAU OF FISHERIES.

Map of

CONTENTNIA RIVER, N.C.

Showing approximate location
of seines and wheels fished
for shad in 1906.

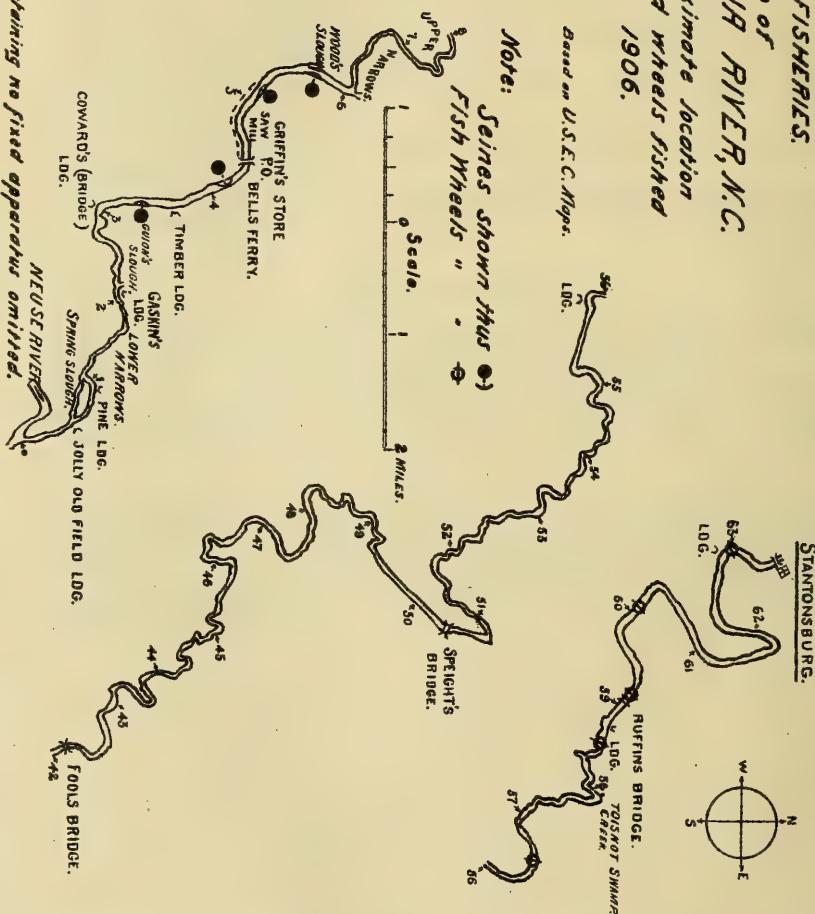
Based on U.S.E.C. Maps.

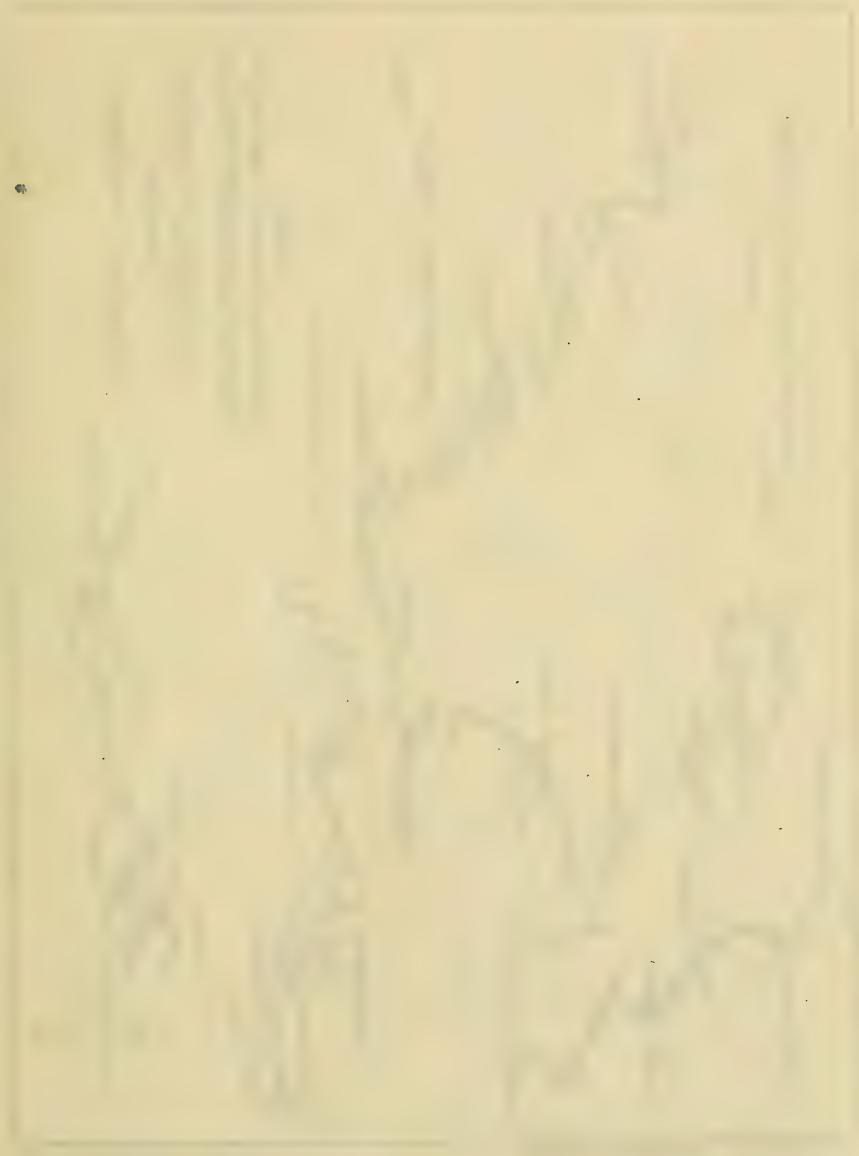
Note:

Seines shown thus ●

Fish Wheels " " - - -

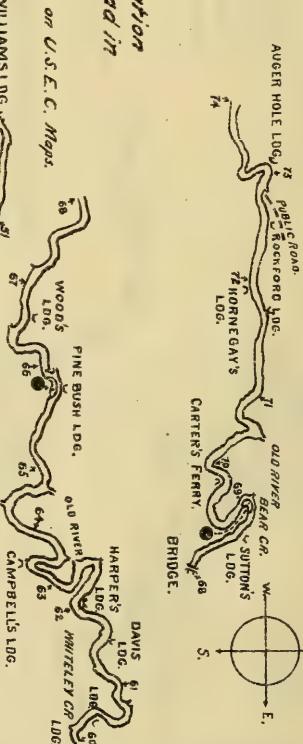
Scale.
1 MILE.





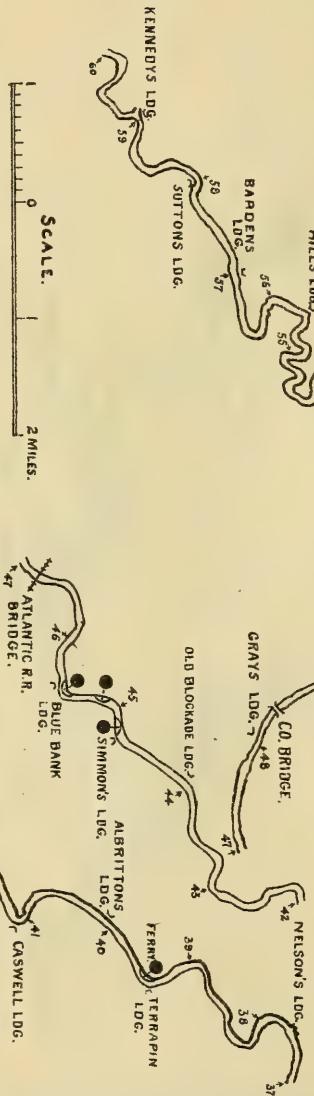
BUREAU OF FISHERIES.
Map of
NEUSE RIVER, N.C.
Showing approximate location
of seines fished for shad in
1906.

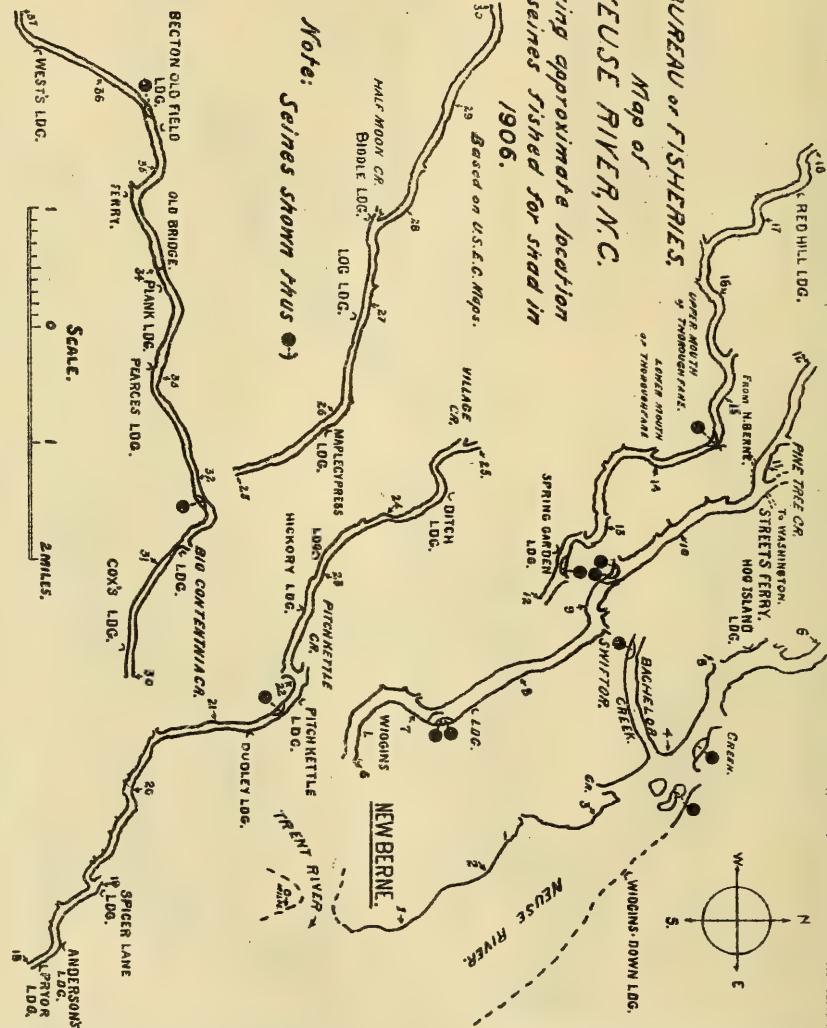
Based on U.S.G.C. Maps.



Note: Seines shown thus ●

OLD FERRY. ■ Kinston.





N. C. GEOLOGICAL SURVEY, ECONOMIC PAPER NO. 12, CHART II.

BUREAU OF FISHERIES.

Map of

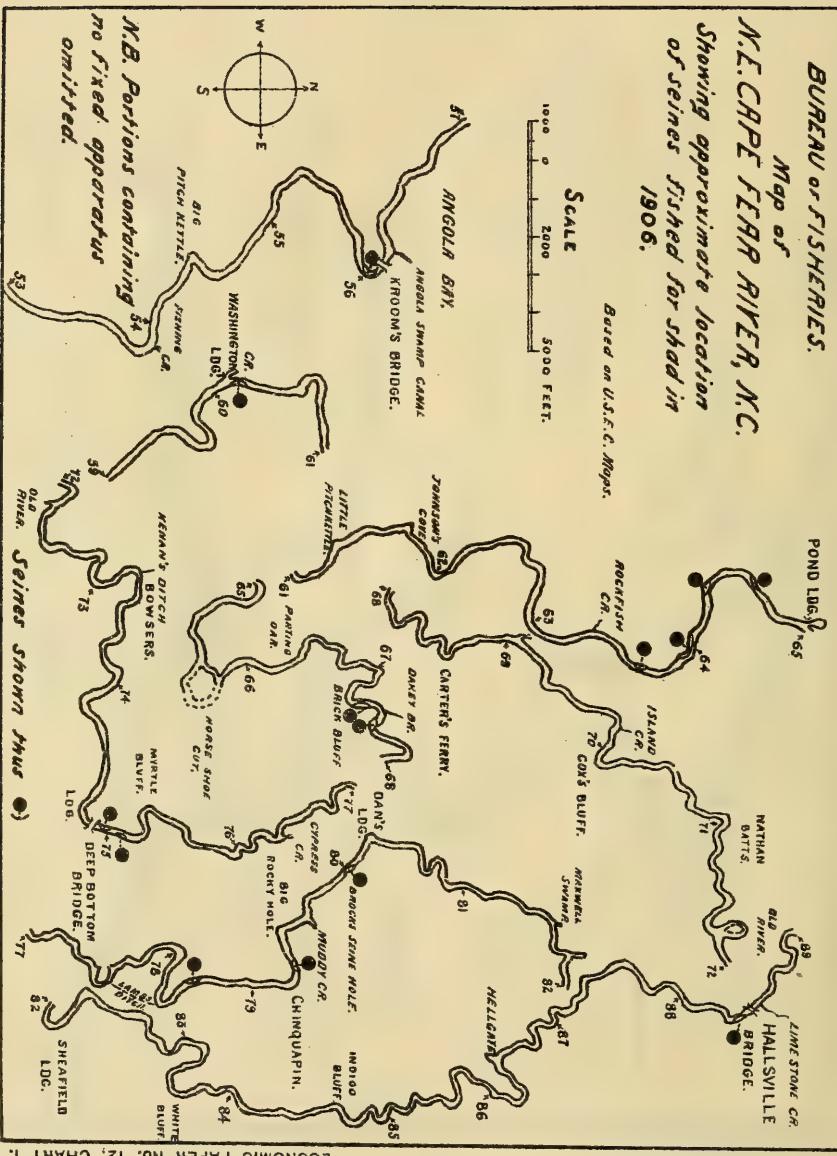
N.E. CAPE Fear River, N.C.

Showing approximate location
of seines fished for shad in
1906.

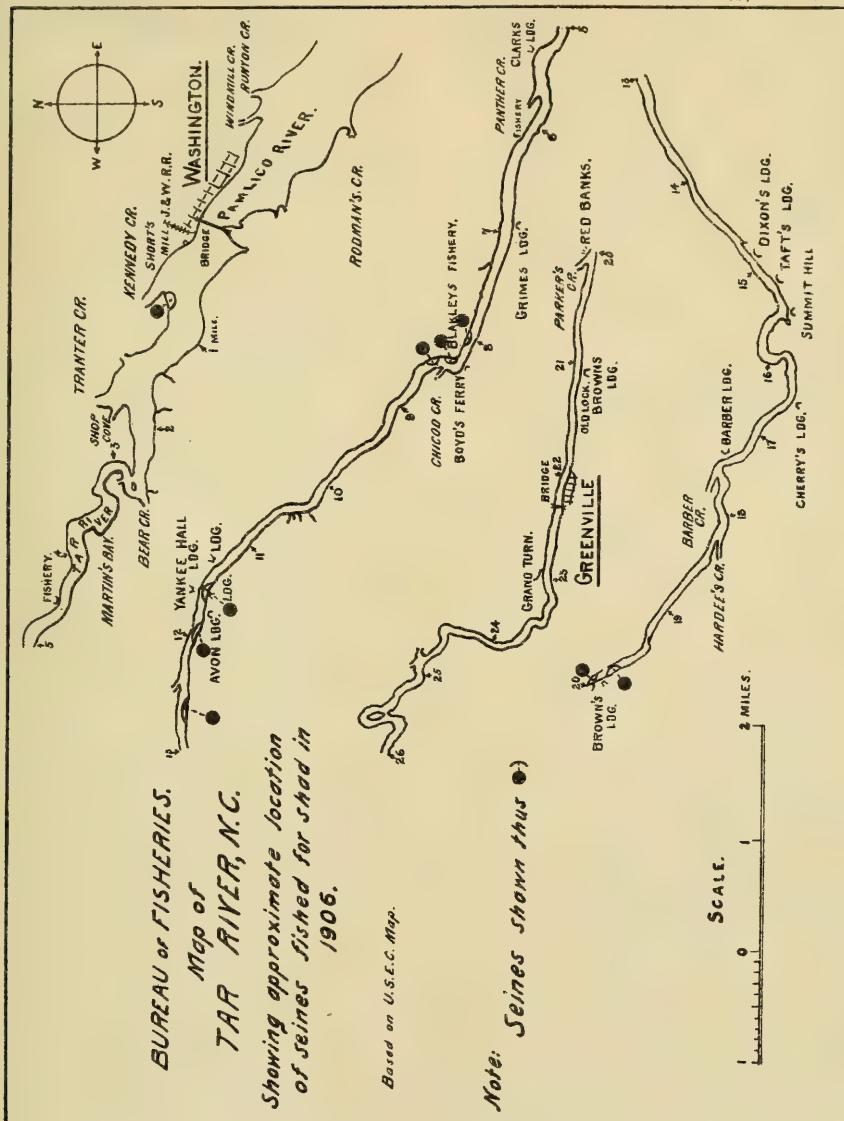
Based on U.S.G.C. Maps.

SCALE

1000 0 2000 5000 FEET.



THE NORRIS PETERS CO., WASHINGTON, D. C.





7

WASHINGTON

COOK INLET

BLOUNT

BAY

M

L

C

R

V

E

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C

R

S

T

H

C



25 rupees
notes -

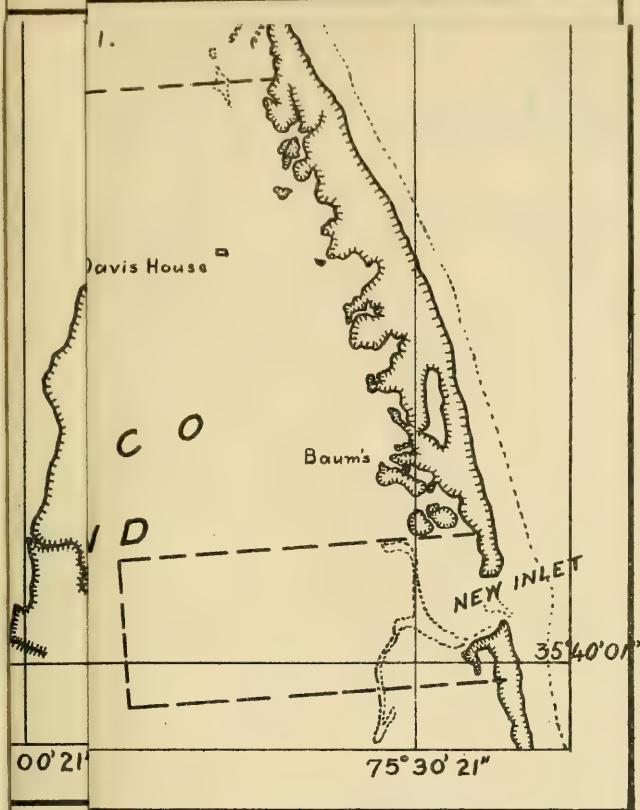
200

Note
Pound Nets shown thus 
Seines " " 





ECONOMIC PAPER No. 12, CHART VIII.



11 N 55

LIBRARY OF CONGRESS



0 002 884 559 5